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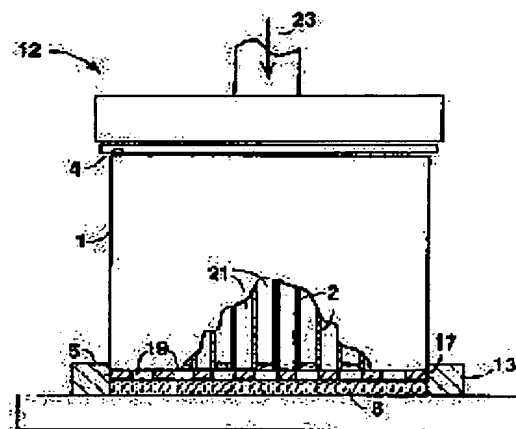
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(54) FORMATION OF HONEYCOM STRUCTURE

(57)Abstract:

PURPOSE: To improve the contact and bonding between a closing material and cell walls when cells are closed in a honeycomb structure.

CONSTITUTION: A container is filled with a closing material 8 up to a desired depth. A mask 17 having the holes corresponding to the open cells 19 of a first terminal surface to be closed is prepared and arranged on the first terminal surface so that the holes thereof are positioned on one straight line along with the open cells 19 of the first terminal surface. A honeycomb structure 1 is arranged in a ring member 13 so that the first terminal surface on which the mask 17 is arranged faces downward to come into contact with a closing material 8. Force is applied to a second terminal surface in the direction shown by an arrow 23 to push the closing material 8 in the cells 19 through the holes of the mask 17 to close the open cells 19 of the honeycomb structure 1. The honeycomb structure 1 is baked to bond the closing material 8 to cell walls 2.



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CLAIMS

[Claim(s)]

[Claim 1] Are the approach of forming the honeycomb structure object with which the cel is blockaded, and the sintering honeycomb structure object which has the matrix of the cell wall which specifies two or more cels prolonged in parallel mutually is prepared in the die-length direction passing through between the end sides where the 1st of a honeycomb structure object and the 2nd counter. The mask which has at least one hole or opening corresponding to at least one open cel of the end side where a container is filled with a lock out ingredient to the desired depth, and the 1st of said honeycomb structure object which should be blockaded counters is prepared. It arranges on the end side where the 1st counters. there is at least one hole on said open cel of the end side where the 1st counters and straight line -- as -- said mask -- this -- So that the end side where the 1st which has arranged said mask counters may face caudad and said lock out ingredient may be touched Arrange said honeycomb structure object in said container, and the force is applied to said end side where the 2nd counters. The approach characterized by consisting of each process which said lock out ingredient is stuffed [process] into said cel through said hole or opening, said open cel of said honeycomb structure object is blockaded [process], and said honeycomb structure object is calcinated [process], and combines said lock out ingredient with said cell wall.

[Claim 2] The approach according to claim 1 characterized by said lock out ingredient consisting of lock out cement and a foaming agent.

[Claim 3] The approach according to claim 2 characterized by said lock out ingredient consisting of about 80% of beta spodumene granulated glass, about 4%-15% of zinc oxide, about 3% of silicon carbide, about 2%-4% of methyl cellulose binder, and water of sufficient amount to form a paste.

[Claim 4] The approach according to claim 3 characterized by said lock out ingredient containing about 24%-27% of water.

[Claim 5] The approach according to claim 3 characterized by calcinating said honeycomb structure object at the temperature of the range of 1000 to 1250 degrees C.

[Claim 6] Said container is the ring carried on the base plate or the platform. Said ring is filled with enough lock out ingredients to make a plug said honeycomb structure object by desired Mr. Fukashi. An approach given [claim 1 characterized by including each process which arranges said honeycomb structure object in said ring so that the end side where the 1st which arranged said mask counters may contact said lock out ingredient, before applying said force and calcinating said honeycomb structure object to] in 5 any 1 terms.

[Claim 7] The approach according to claim 6 characterized by including the process which said lock out ingredient makes it easy to vibrate said base plate and to flow into said open cel of said honeycomb structure object, applying the force to said end side where the 2nd counters.

[Claim 8] The approach according to claim 6 characterized by including each process which picks out said honeycomb structure object from said ring, sinters the honeycomb structure object which plugged up a part of cel, and combines said lock out ingredient with said cell wall.

[Claim 9] There is at least one open hole of said mask on said at least one open cel of the end side where the 2nd counters and straight line. Said mask is arranged to said end side where the 2nd counters as the cel is open in respect of the end which said 1st [the] counters. Said honeycomb structure object is arranged so that the end side where the 2nd which has arranged said mask counters may face caudad and said lock out ingredient may be contacted. The approach according to claim 8 characterized by including each process which applies the force to a lower part to said end side where the 1st counters, and said lock out ingredient is pushed in into said cel

through said hole or opening, and plugs up at least one open cel of said honeycomb structure object.

[Claim 10] Said mask has closed in respect of the end which the cel of the 1st group opens in respect of the end which said 1st [the] counters, and said 2nd [the] counters. The approach according to claim 9 characterized by including two or more holes or openings which are located so that it may be open in respect of the end which the cel of the 2nd group closes in respect of the end which said 1st [the] counters, and said 2nd [the] counters and the cel of said 1st group may form the honeycomb structure object which shares the cel and cell wall of said 2nd group.

[Claim 11] An approach given [claim 1 characterized by soaking the cel of said honeycomb structure object by the thin slurry of water or said lock out ingredient first before a lock out process to] in 11 any 1 terms.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] or [that this invention blockades alternatively the open cel or the open channel of lock out cement (plugging cement) and a honeycomb structure object] -- or it is related with the approach of carrying out a seal and making powerful association between a lock out ingredient and a cell wall.

[0002]

[Description of the Prior Art] The honeycomb structure object which blockaded the open cel chosen beforehand is useful for many applications, such as for example, a diesel particle filter (DPF). Various approaches are used for the process which plugs up the open channel of a honeycomb structure object. In case the blockaded filter is manufactured, an extrusion honeycomb structure object is dried, it sinters, and the body which is strong and has cohesive force is formed. Subsequently, a plug is made the sintered body, and after drying, the lock out ingredient which calcinates the structure again and constitutes a plug is sintered. A plug is combined [be / it / under / 2nd baking or sintering process / reaction] with a cell wall or a channel. In case it calcinates, when the cel is not completely filled by the plug, a lock out ingredient is compressed and association may become weak. Moreover, a plug may become weak or a plug may be lost. In order to ease the above-mentioned problem, calcinating a honeycomb structure object and a lock out ingredient in one baking phase is proposed.

[0003] In the most general technique, it is blockading by arranging this structure in a block device so that the end side of the sintering honeycomb structure object which should plug up a cel may face up perpendicularly. Subsequently, the cel of the structure which the end side which faces up chose beforehand is plugged up by giving cement so that the end side which faces up may be covered, and applying the force which pushes in this cement into a cel. It makes a plug one [at a time] at once the cel whose cel or plug which is not carried out in the plug was lost by hand. As for this technique, a hand not only starts clearly, but what also has good association between a lock out ingredient and a cell wall has not become. Moreover, since lock out cement is given caudad (namely, the direction of a top-down) from the upper part, cement will be caudad pulled by gravity, and it will separate from a cell wall, therefore the plug of the taper configuration where association to a cell wall is weak, or a projectile configuration will be formed.

[0004] Some methods of manufacturing the honeycomb structure object which carried out the plug are proposed. for example, -- until it gears in the cel as which the mask which has a projection was inserted in the honeycomb front face, and the projection was chosen so that the open cel as which the honeycomb was chosen may gear to a projection -- a honeycomb structure object -- or making a plug such the structure is proposed by vibrating either of the masks and making it rotate. In another technique, making the paste which scoured a part for the end of a honeycomb structure object at the end of the channel to which the seal slurry was continuously immersed and given into seal slurry mixture flow is proposed.

[0005] Furthermore, the specific batch constituent which constitutes a lock out ingredient which is indicated by U.S. Pat. No. 4,455,180 and recurrence line U.S. Pat. No. 31,405 is proposed. These patents are quoted here.

[0006] According to the approach mentioned above, cordierite mixture of the thick water base is given from the upper part through a mask, and the plug is made the mutual cel of a honeycomb structure object. Since a plug is caudad given from the upper part, there is no countervailing power (opposing force) which ensures a plug spreading and filling each cel completely. Consequently, since bonding strength is weak, leakage may arise or a plug may be lost.

[0007]

[Problem(s) to be Solved by the Invention] The constituent and approach of making a plug a honeycomb structure object and combining between a lock out ingredient and cell walls good which were improved one layer are searched for succeedingly.

[0008] The purpose of this invention is to offer the approach and constituent which make a plug the cel of a honeycomb structure object and make good the contact and association between a lock out ingredient and a cell wall.

[0009]

[Means for Solving the Problem] According to this invention, the sintering honeycomb structure object which has the matrix of the cell wall which specifies two or more cells mutually prolonged in parallel in the die-length direction in between the end sides where the 1st of a honeycomb structure object and the 2nd counter is offered. Carry a ring in the outside of a base plate and said ring is filled with the layer of enough lock out ingredients to make a plug said honeycomb structure object by desired Mr. Fukashi. The mask which has opening corresponding to at least one open cel of the end side where the 1st of at least one hole or the honeycomb structure object which should be closed counters is prepared. Said mask is arranged on the end side where the 1st counters. said hole is on said open cel of the end side where the 1st counters and straight line -- as -- this -- A honeycomb structure object is arranged in a ring so that the 1st end side which has arranged the mask may contact said lock out ingredient. The above-mentioned purpose of this invention and other purposes can be attained by applying the force to the end side where the 2nd counters, pushing in said lock out ingredient through said hole, and plugging up the open cel of said honeycomb structure object. Then, the honeycomb structure object which carried out the plug is sintered, and a lock out ingredient is combined with a cell wall.

[0010] For example, it aims at forming a diesel particle filter, after carrying out a plug, as mentioned above to the 1st end side. The cel of the 1st group opened in respect of the 1st end, and has closed in respect of the 2nd end. The cel of the 2nd group closes in respect of the 1st end, it is open in respect of the 2nd end, and the process mentioned above in order to make a plug the 2nd end side so that the cells of each of the 1st group may form the honeycomb structure object which is sharing the cel and cell wall of the 2nd group is repeated.

[0011] another operative condition -- it sets like and this invention relates to the approach of making a plug a mutual cel by using the lock out cement which consists of silicon carbide as beta spodumene granulated glass and a foaming agent. In case it heats, glass fuses, and glass foams by silicon carbide, it expands, and the open field between a plug and a cell wall is taken up.

[0012]

[Example] Hereafter, this invention is explained to a detail with reference to the example shown in a drawing.

[0013] The honeycomb filter object which carried out the plug shown in drawing 1 consists of cellular one which has Matrix 2 of the crossover cell wall which specifies two or more cells or channels 3 which are mutually prolonged in parallel in the die-length direction through a honeycomb filter object among the end sides 4 and 5 where a honeycomb filter object counters, or a honeycomb structure object 1. Although the cel 7 of one group is opened in respect of [4] the end which one side counters as illustrated, in respect of [5] the end which another side counters, it is closed with the lock out ingredient 8, or is closed, or the plug is carried out. The cel 10 of the group of another side currently opened in respect of [5] the end which counters is closed in respect of [4] the end which counters with a plug 11. As for both plugs 8 and 11, only a desired distance is contained inside from the end sides 4 and 5 -- a grid pattern -- or it is in either of the checkered board patterns.

[0014] Next, drawing 2 is referred to. The approach and equipment 12 of this invention include the ring object 13 carried on lock out the base plate connected with the vibrator (not shown) which makes a flow of the lock out ingredient 8 easy in process if needed or a platform 15. The ring object 13 has the bore which suits the outer diameter of the honeycomb structure object 1 which should make a plug desirable. The ring object 13 is fulfilled to the depth x of a request of the layer of enough lock out ingredients 8 to make a plug a honeycomb structure object, as shown in drawing 4 . In order to form the cel of the 1st group closed in respect of the end which is open in respect of one end of the structure, and counters It is a wrap by the mask 17 which has at least one hole or opening 19 so that one end side of a honeycomb structure object may be located on at least one open corresponding cel 21 in either of the end sides where the honeycomb structure object 1 with which a hole or opening 19 should plug up the open cel 21 counters. Consequently, only the cel which should be plugged up with a lock out ingredient is located on the hole with which a mask 17 corresponds, and a straight line. In

drawing 2 , the end side 5 where the mask 17 has been arranged on the field has been arranged in the ring object 13 so that the lock out ingredient 8 may be touched. In order to push in a lock out ingredient into the open cel 21, the force was applied in the direction of the arrow head 23 shown in drawing 2 R> 2 to the end side 4 where one side of a honeycomb structure object counters.

[0015] What kind of suitable ingredient may be used for the ingredient used for a mask. For example, it turns out that plastics and rice paper are useful for this purpose. Moreover, although a base plate and a ring object may be constituted from what kind of suitable ingredient, a lock out ingredient like Plexiglas of the suitable ingredient which does not react is desirable, for example.

[0016] A cel may be beforehand soaked before lock out by immersing the cel which should carry out a plug into the thin slurry of water or a lock out ingredient if needed. When using a very deep lock out ingredient, especially the thing soaked beforehand is useful. If water or a slurry is in a cell wall, it is maintained by the condition that the paste or the lock out ingredient was damp, and although he does not plan to restrain by the theory, when the paste flows to a cell wall, it is thought that it is assistance to fill up with a cel and increase by that cause. After soaking a cell wall beforehand, the honeycomb structure object was dried partially, superfluous water was removed, in order to abolish dispersion in a lock out ingredient, level of wetting was made into max, and the plug was carried out. In the deep paste, it turned out that lock out becomes good, so that the drying time of the honeycomb structure object beforehand soaked after the immersion in water or a thin slurry was short.

[0017] Moreover, a cel is made easy to be filled up, and in order to improve contact, the oscillating force may be applied to a base plate while pushing in the lock out ingredient into the cel. When using a deep paste especially, it is so effective that the amplitude is small. In a deep paste, in order that this lock out ingredient may bounce within a cel rather than it will open a lock out ingredient and will be filled up with a cel, if the amplitude is large, it is thought that it checks it being filled up with a cel and carrying out a plug.

[0018] As a variable of the process which may be controlled and adjusted in order to raise the quality of lock out, the amount of the consistency of a lock out ingredient or thickness, and the force to apply, the amplitude of a duration and the oscillating force, the drying time of the structure soaked in advance of lock out, etc. are mentioned. The inclination for it to be distorted in a cell wall and for contact to get worse has a deep paste, and a thin paste tends to form an impression in the end inside a plug by one side. In a very thin paste, an impression will become deep, it will clarify further, and the tunnel which passes a plug as occasionally shown in drawing 8 will be formed in it.

[0019] In order to combine a lock out ingredient with a cell wall, the water which dries a honeycomb structure object together with a plug, and is contained in lock out cement was removed, and it sintered at suitable sintering temperature. Sintering temperature changes depending on the lock out ingredient to be used. For example, the plug of standard cordierite cement can be sintered at the temperature of about 1400 degrees C, and the foaming cement of this invention can be sintered at the temperature of the range of 1300 degrees C from 900 ** by one side.

[0020] The cel of the 1st group opened in respect of the 1st end, and has closed in respect of the 2nd end, and the cel of the 2nd group closes in respect of the 1st end, and are open in respect of the 2nd end. In order that each of the cel of the 1st group may share the cel and cell wall of the 2nd group and may form a honeycomb structure object like a diesel particle filter After making a plug the end side where the 1st counters, the honeycomb structure object was rotated so that the end side which already carried out the plug might serve as the bottom, the process mentioned above before the desiccation process and the sintering process was repeated, and the plug was carried out in respect of the end which counters the cel of the 2nd group.

[0021] It was much more uniform and by making a plug a honeycomb structure object toward a top from a base so that it may be shown in the approach mentioned above, i.e., drawing 2 , showed that a plug with good association was obtained. This is intelligible when the approach of this invention shown in the example of a comparison shown in drawing 3 which used the up-and-down (up-down) lock out approach of the conventional technique, and drawing 4 is compared. By making a plug a hole using the bottom-up technique (bottom-up approach) of this invention, a taper phenomenon as shown in drawing 3 produced with gravity in the approach (the up-and-down technique) of the conventional technique is not seen, but without a plug serving as a projectile configuration, a plug contacts a cell wall good and combines with it. moreover, when a plug is caudad carried out from the upper part, as deep lock out cement is in the inclination which bends in a cel, does not try to try (that is, it can twist) to rotate, and forms the plug of **, therefore it is shown in drawing 5 , the contact

and adhesion between a paste and a cell wall will become weak. In contrast with this, when making a plug a cel using the same deep paste using the technique to the upper part [lower part / of this invention], as shown in drawing 6 , association and contact are improved remarkably.

[0022] A plug can be formed no matter what ingredient [lock out] it may use, if suitable. A cell wall can be pasted and the lock out ingredient which has the heat characteristic to which the heat characteristic can sinter a lock out ingredient to a honeycomb structure object and coincidence may be used for the approach of this invention. Preferably, after sintering a honeycomb structure object, lock out cement is given to a cel. When blockading after sintering a honeycomb structure object, as long as it can sinter at the temperature below the sintering temperature of a honeycomb structure object, what kind of lock out ingredient may be used. In the case of a cordierite honeycomb structure object, the lock out ingredient indicated by U.S. Pat. No. 4,455,180 and recurrence line U.S. Pat. No. 31,405 may be used.

[0023] When the lock out cement which added the suitable foaming agent was used, it turned out that lock out and association are made to the outstanding thing. By using the lock out cement with which silicon carbide consists of beta spodumene granulated glass added as a foaming agent especially showed that lock out was possible for what was further excellent. In case it calcinates, a constituent fuses first, subsequently crystalizes and forms a beta spodumene phase. The fused glass foams and expands by silicon carbide, and it is filled up with the space between a plug and a cell wall. In the generated structure, as shown in drawing 7 R> 7, association and contact are excellent. Then, a beta spodumene phase crystalizes and the beta spodumene structure or the foaming cement plug 25 is formed. After a beta spodumene constituent foams and being filled up with a cel, lock out cement 25 reacts with a cell wall 2, and joins together. Foaming lock out cement 25 consists of a closed cell 27 which restricts that a gas passes the lock out ingredient 25, or is barred on a real target.

[0024] Although what kind of constituent could be used for operation of this invention as long as it was the range which crystalizes in the case of baking and can form the beta spodumene structure, it turned out that especially the constituent shown below is useful.

[0025]

Group ** Object A B Beta spodumene glass powder 80.32% 80.43% A zinc oxide (AZO-66) 4.45 13.84 A calcium oxide 8.71 - Silicon carbide (600 shot) 3.29 3.28 Methocel (trademark) A4M 3.23 2.46 Water requirement Some cordierite honeycomb structure objects whose initial-complement diameters are 15.24 cm (6 inches) and whose cel consistencies are a 15.5 cel square centimeter (100 cel square inch) are sintered at the temperature of about 1400 degrees C. The plug was carried out as mentioned above using the above-mentioned constituent. Subsequently the structure which has the plug formed from Constituents A and B using the baking schedule of the range of 36 to 42 hours according to the presentation of a paste and the size of a honeycomb structure object was calcinated, and it was made to crystallize at the temperature of 1085 degrees C and 1176 degrees C, respectively. The appearance of the foaming plug was the same as the appearance of the foaming cement shown in drawing 7 , or sponge. The porosity of a plug 25 was larger than 50%, and the structure of a hole was irregular. It had combined with the cell wall very strongly, and cement was considered to produce the reaction which it is between the cell walls 2 which consist of a plug 25 which consists of beta spodumene, and cordierite. Furthermore, pore (pore) was formed with the closed cell 27 which prevents a gas from passing a plug. As mentioned above, as long as it crystalizes in the case of baking and can form beta spodumene, what kind of constituent may be used for this invention.

[0026] If foaming cement which was mentioned above is used, since it may react with a cell wall by foaming and restoration will fully be made, the quality of the lock out obtained by the technique from the conventional upper part to a lower part is improved remarkably.

[0027] Or it can use for the amount of the water needed for forming foaming cement making a plug a cel with the desired thickness or the consistency, and its paste of the paste to generate, it changes depending on desired ability. About the above-mentioned constituent, the content of water is about 33% based on a solid-state even in 24% to 27% based on mixture.

[0028] Even when having used the foaming cement of this invention and a plug was made a honeycomb structure object using the conventional approach of inserting a plug into a cel caudad from the upper part, it turned out that association with a plug and a cell wall is raised remarkably. This is for the foaming cement of this invention expanding during baking, and filling the space between the plug of a taper configuration, and a

cell wall, therefore fully plugging up such a plug.

[0029] If it has a foaming property, any lock out cement can be used for this invention. For example, although he does not plan to restrain by the theory, since cordierite is a crystalline substance, it is thought that it cannot supplement with any gases formed since foaming arose. However, the suitable additive for cordierite is added, and cordierite may be used, as long as it can raise gaseous complementation and can produce foaming. Moreover, probably, it will also be useful to this invention to use the low eutectic glass near the presentation of cordierite besides compensating with glass the oxide which can form cordierite in response to the end of a baking schedule. In a glass phase phase, it supplements with a gas, foaming is produced, association with a cell wall is made good, and cordierite is formed by the reaction of a crystalline substance phase following it.

[0030] In order to increase the amount of contact between a plug and a cell wall, the cel which should make a plug to the beginning may be soaked by water or the desirable thin slurry of a lock out ingredient before lock out. It will become more desirable to soak a cel beforehand, so that a lock out constituent becomes deep. Contact becomes good and it becomes still easier to plug up a cel, so that a lock out ingredient becomes thin. However, when blockading using the technique from the upper part to a lower part, a very thin paste may form a tunnel, as it mentioned above, and/or it hung down the cell wall as ****. The thickness which carries out suitable changes to a lock out ingredient in a number of inside depending on an operating condition like the wall thickness of a honeycomb structure object, and a cel consistency. The thickness suitable for each application can be measured by experiment. For example, it turned out that the cordierite lock out cement which has water to 50% based on a solid-state can be used according to the approach of this invention. However, although a thin paste tends to make contact between a plug and a cell wall good, in such a paste, eye a crack as shown in the tunnel flaw, i.e., drawing 8 , an open path, or separation may arise.

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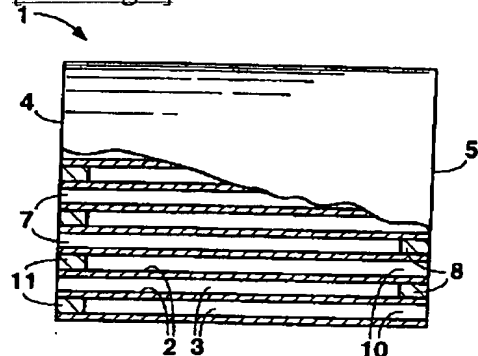
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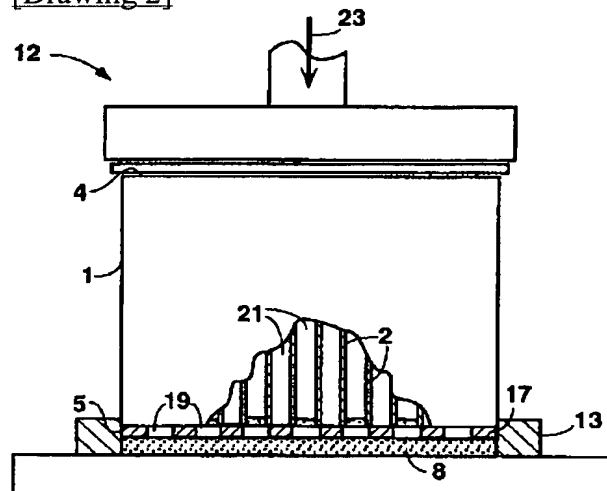
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DRAWINGS

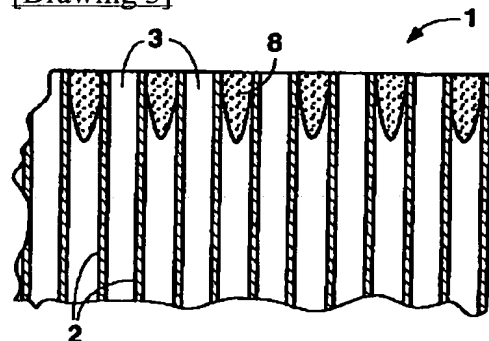
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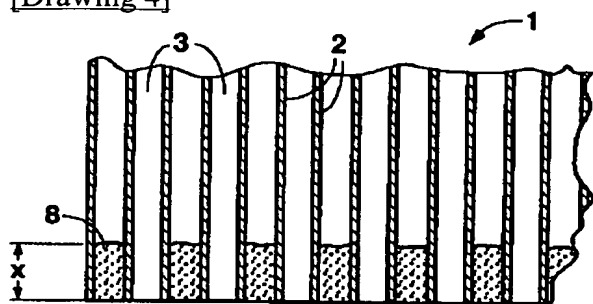
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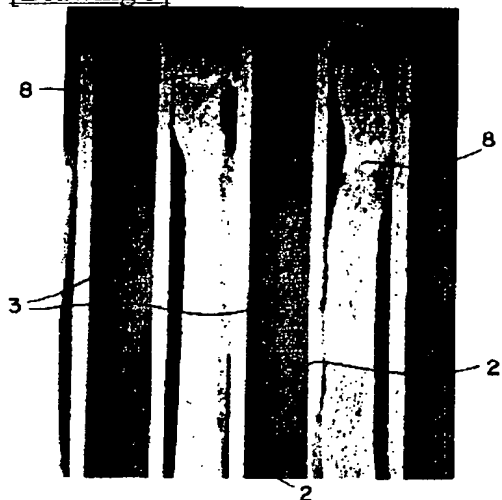
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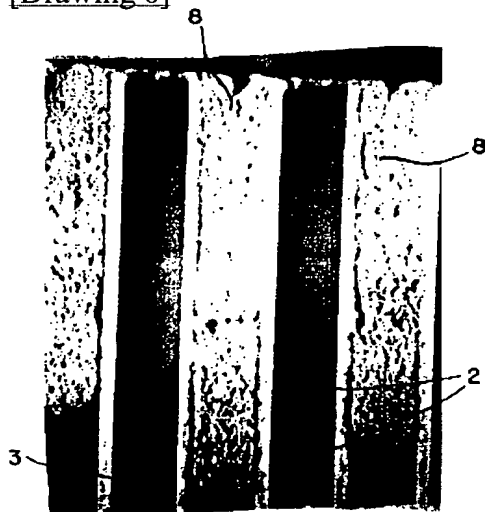
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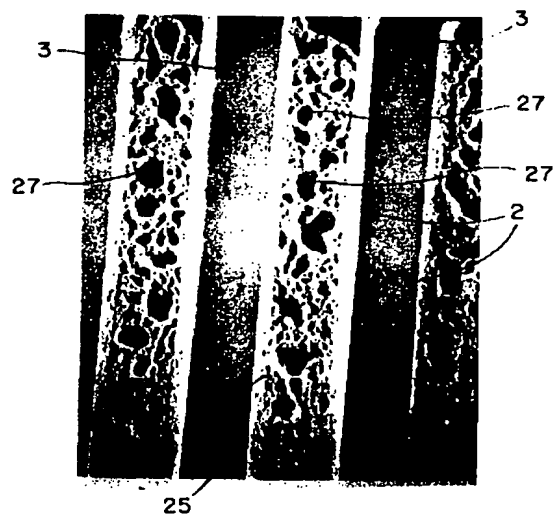
[Drawing 5]



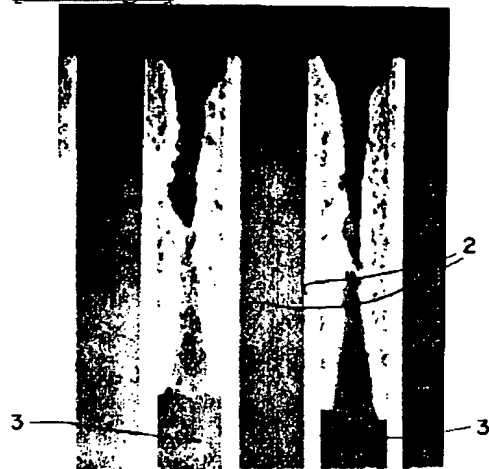
[Drawing 6]



[Drawing 7]



[Drawing 8]



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